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LONG-TERM FINANCIAL SUSTAINABILITY AND INEQUALITY OF PHARMACEUTICAL EXPENDITURE IN THE EUROPEAN UNION, 2011-2060: A COMPARATIVE ANALYSIS

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Abstract

The European Union has achieved near-universal health coverage (Mean=99.15%; Standard Deviation=1.46%; Variation Coefficient=1%) and equity of access to healthcare services but, in the period 2000-10, such goal has been achieved at a Not Sustainable rate with total health expenditure growth (4.2%, STDDEV=2.4%) exceeding the growth rate of the GDP (1.7%,STDDEV=1.4%) by +2.5 percentage points on average and pharmaceutical expenditure (3.5%, STDDEV=3.0%) exceeding the growth rate of the GDP by +1.8 points. In the period 2011-2060 the GDP is expected to reduce and stabilize its growth rate from an average of 1.7% (STDDEV=1.4%) to an average of 1.6% with lower variation among the countries of the EU (STDDEV=0.5%). There follows that if the growth rate of health and pharmaceutical expenditure of the period 2000-10 is not reduced in the period 2011-60 only 4 nations will achieve economic and financial sustainability: Netherlands, Sweden, Denmark and Italy. Health policymakers in the European Union should account for this long-term expenditure growth pattern and reform in the efficiency and effectiveness of health and pharmaceutical care is necessary if health outcomes are to be improved and at the same time the economic and financial sustainability of the European universal welfare model is to be preserved and inequality avoided.

Keywords: Universal Coverage, Pharmaceutical Expenditure, Total Healthcare Expenditure, Gross Domestic Product, Long-term Economic and Financial Sustainability

Background

The member states of the European Union guarantee near-universal health coverage (Mean=99.15%; Standard Deviation=1.46%; Variation Coefficient=1%) [43][45] and equity of access to healthcare services and pharmaceutical active principles approved by the European Medicines Agency and national Agencies for reimbursement [6][15]. However in 2013 [44] the enduring effects of the 2008 financial crisis, in terms of recession, growing sovereign debt [1] and Financial consolidation [46], have risen concerns [44] about the long-term [42][44] sustainability [49] of the European welfare model.

The research question of this paper is whether the Per Capita Real Average Annual Growth Rate (PCR-AAGR) of pharmaceutical expenditure in the European Union in the period 2000-2010 (PCR-AAGR=3.5%; STDDEV=3.0%; VC=0.9) will be economically and financially sustainable in the long-term, i.e. in the period 2011-2060, on the basis of the OECD estimate of the growth of the Gross Domestic Product in such period of (PCR-AAGR=1.6%; STDDEV=0.5%; VC=0.3) (Exhibit 1).

In order to assess systematically across the EU the joint economic and financial sustainability of pharmaceutical expenditure in the periods 2000-10 and 2011-60, the present

paper has applied the World Health Organization's conceptual framework outlined by Thomson, S., Foubister T. and Mossialos E. (WHO 2009).

Exhibit 1: Per Capita Real Average Annual Growth Rate of GDP, Total Health Expenditure and Total Pharmaceutical Expenditure in the European Union (*N*=21) in the periods 2000-2010 and 2011-2060

EU 21	GDP 2000-2009	THE 2000-2010	TPE 2000-2010	GDP 2011-2060
Mean	**1.7**	**4.2**	**3.5**	**1.6**
Standard Deviation	**1.4**	**2.4**	**3.0**	**0.5**
Variation Coefficient	**0.8**	**0.6**	**0.9**	**0.3**

Source: Authors' elaborations on OECD Health Data 2011

Legenda:
PCR AAGR – Per Capita Real Average Annual Growth Rate
GDP – Per Capita Real Gross Domestic Product;
THE – Per Capita Real Total Healthcare Expenditure
TPE - Per Capita Real Total Pharmaceutical Expenditure

Methods

Thomson S., Foubister T., and Mossialos E. (WHO 2009) [53] define economic and Financial sustainability as:

- Economic sustainability specifically refers to growth in public health financing as a proportion of gross domestic product (GDP). Financing on health is sustainable up to the point at which the social cost of health financing exceeds the value produced by that financing. If health financing sufficiently threatens other valued areas of economic activity, health financing may come to be seen as economically unsustainable. In order to exemplify, every dollar spent on health care represents one fewer dollars spent on education, national defense, housing, subsidies. The more we spend on health care, the less we are able to spend elsewhere;
- Financial sustainability of a health system relates specifically to public financing on health care. A health care system may be economically sustainable and yet Financially unsustainable if internal public revenue is not sufficient to meet public financing.

In the present research we will adapt the WHO definition of Financial and economic sustainability in a such a way that pharmaceutical expenditure, as any other expenditure, in order to be sustainable must be first of all financially *and* then economically sustainable. In other words, if a category of expenditure is not financially sustainable, its economic sustainability cannot be assessed since Financial consolidation and pervasive reform make predictions regarding the direction of economic restructuring unreliable.

In conditional terms, if:

- PCR-AAGR is the per capita real annual average growth rate;
- GDP the gross domestic product;
- THE is total healthcare expenditure and;
- TPE is total pharmaceutical expenditure:

then pharmaceutical expenditure of a health system is:

- Financially Sustainable $=if\ \{\text{PCR-AAGR TPE} \leq \text{PCR-AAGR GDP}\}$ and Not Sustainable otherwise;
- Economically Sustainable

$=if\ \{\text{PCR-AAGR TPE} \leq \text{PCR-AAGR GDP}\}and\ \{\text{PCR-AAGR TPE} \leq \text{PCR-AAGR THE}\}$ and Financially Sustainable otherwise.

This approach is synthesized in Exhibit 2. The red line represents *f(x)=1* along which per capita real average annual growth rate of the GDP (x axis) is equal to the growth rate of total

health and pharmaceutical expenditure (y axis). The reduction in variability in the growth rate of the GDP across the EU in the period 2011-60 can be seen in terms of the clustering of datapoints around the mean. The effects of this variation of the GDP growth rate in terms of the divergence of the regression lines of total health and pharmaceutical expenditure can also be visualized together with the reduction in the values of the coefficients of determination (R^2) from 2000-10 to 2011-60 of both health expenditure (from 0.66 to 0.31) and pharmaceutical expenditure (from 0.44 to 0.66).

This paper analyzes the OECD healthcare and pharmaceutical expenditure and reimbursement datasets for the period 2000-2009 and the OECD report on long-term economic growth in the period 2011-2060.

For definitions and comparability we refer in full to the: "OECD, Eurostat, World Health Organization: A system of health accounts – Edition 2011". The OECD defines pharmaceutical expenditure as:

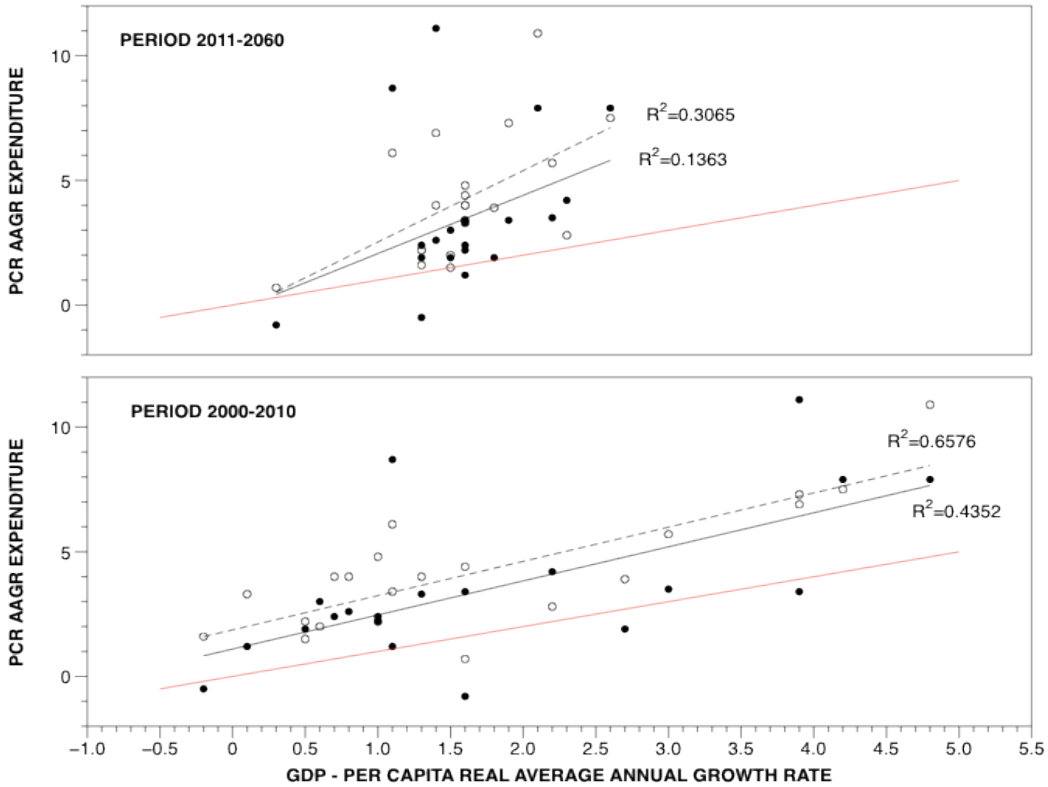
Pharmaceutical expenditure covers spending on prescription medicines and self-medication, often referred to as over-the-counter products. For some countries, other medical non-durables such as syringes, bandages, etc. may be included in the total. It also includes pharmacists' remuneration when the latter is separate from the price of medicines. Pharmaceuticals consumed in hospitals are excluded (on average they account for around 15% of total pharmaceutical spending). Final expenditure on pharmaceuticals includes wholesale and retail margins and value-added tax.

The 21 countries of the European Union analyzed have been selected on unbiased grounds as the only countries for which all information was available and homogeneous in the OECD databases.

Per capita real data have been utilized to account for the demographic dividend and inflation.

All data has been downloaded in .csv formats and analyzed-plotted with R 3.0.1 software.

Exhibit 2: Per Capita Real Average Annual Growth Rate of the Gross Domestic Product, of Total Healthcare Expenditure and of Total Pharmaceutical Expenditure in 21 member states of the European Union in the period 2000-10 and 2011-60



Source: Authors' elaborations on OECD Health Data 2011

Legenda:
BLACK DOTS - Per capita real Average Annual Growth Rate of Pharmaceutical Expenditure (TPE)
HOLLOW DOTS - Per capita real Average Annual Growth Rate of Total Health Expenditure (THE)
SOLID LINE – Regression Line of TPE
DASHED LINE – Regression Line of THE
RED LINE – f(x)=1
Notes:

Countries in decreasing order of AAGR GDP. EU *N*=21 out of *N*=27 member states have been analyzed for which the OECD datasets are consistent in the period 2000-2010 and 2011-2060 The original misalignment in the OECD datasets between the time period 2000-2009 of GDP growth and the time period 2000-2010 of Total Healthcare and Pharmaceutical Expenditure has been maintained for consistency with the OECD Health Data 2011 datasets.

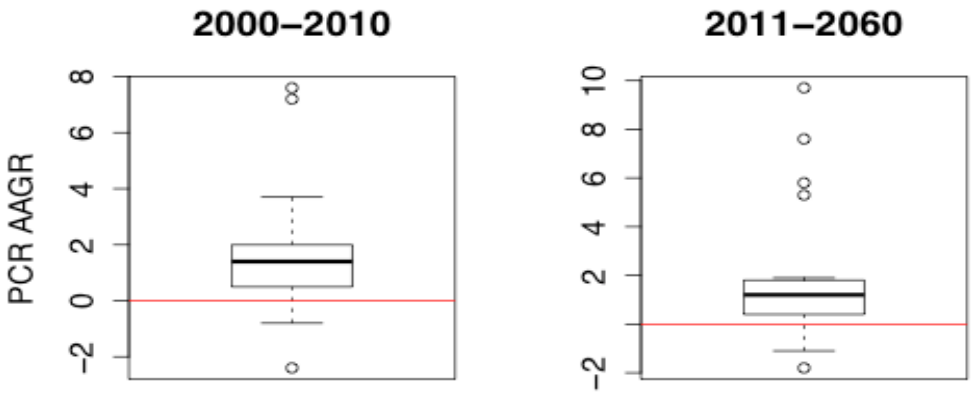
Findings

From an economic and financial point of view Exhibits 1 and 2 highlight the fact that, in the post-Euro currency period 2000-2010, in 21 member states of the European Union (EU 21) the per capita real Average Annual Growth Rate (PCR-AAGR) of Total Healthcare Expenditure (PCR-AAGR=4.2%; STDDEV=2.4%; VC=0.6) has been consistently higher than the PCR-AAGR of the national Gross Domestic Product (PCR-AAGR=1.7%; STDDEV=1.4%; VC=0.8), with the sole exception of Luxembourg. One country, Italy, highlights a positive growth of Total Healthcare Expenditure (PCR-AAGR=1.6%) even if the growth of the GDP is negative in the same period (PCR-AAGR=-0.2%).

As far as Pharmaceutical Expenditure is concerned, the situation is only slightly different (PCR-AAGR=3.5%; STDDEV=3.0%; VC=0.9), with only 2 members for whom the growth rate is lower than the growth rate of the GDP - Poland (PCR-AAGR=3.4%) and Slovenia (PCR-AAGR=1.9%) - and 2 for whom it is actually negative: Luxembourg (PCR-AAGR=-0.8%) and Italy (PCR-AAGR=-0.5%).

Exhibit 3 analyzes the difference between the growth rate of pharmaceutical expenditure and GDP (Financial Sustainability) in the two periods 2000-10 and 2011-60. In the long-term the difference in the EU 21 will be less uniformly distributed with a mean of 1.9% (STDDEV=2.8%) against the 1.7% (STDDEV=2.3%) of the period 2000-2009 and, as the OECD points out [32], only in the presence of ambitious policy changes, ambitious Financial consolidation efforts and deep structural reforms.

Exhibit 3: Financial Sustainability of Pharmaceutical Expenditure in the European Union (*N*=21) in the periods 2000-2010 and 2011-2060



Source: Authors' elaborations on OECD Health Data 2011

Legenda:
PCR AAGR – Average Annual Growth Rate
Notes:
Software R 3.0.1 – boxplot()

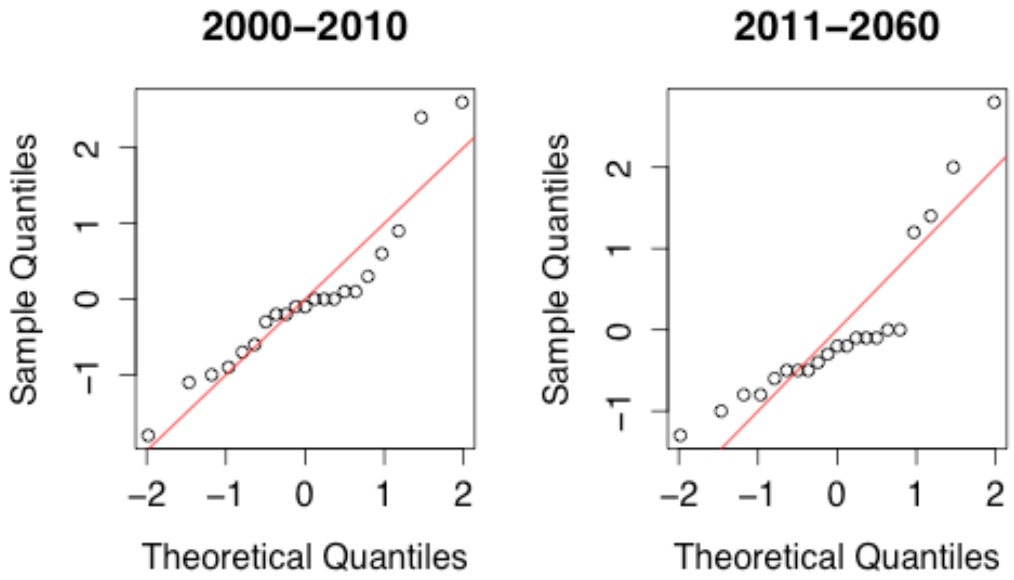
Conclusions

In the period 2000-10 all the 21 countries of the European Union analyzed have achieved near-universal health coverage (Mean=99.15%; Standard Deviation=1.46%; Variation Coefficient=1%) [43][45] and equity of access to healthcare services [6][15] but such goal has been achieved at a Not Sustainable rate (Exhibit 2), with total health expenditure growth (4.2%) exceeding the growth rate of the GDP (1.7%) by +2.5 percentage points on average and pharmaceutical expenditure (3.5%) exceeding the growth rate of the GDP by +1.8 points. Only 4 countries out of 21 have grown at a sustainable rate: Luxembourg, Slovenia, Italy and Poland.

In the period 2011-2060, in the 21 countries analyzed, the GDP is expected to reduce and stabilize its growth rate from an average of 1.7% (STDDEV=1.4%) to an average of 1.6% (STDDEV=0.5%): -0.1% (STDDEV=1.5%). More specifically, if the growth rate in healthcare and pharmaceutical expenditure of the period 2000-10 is not modified in the period 2011-60, only 4 nations will achieve economic and financial sustainability: Netherlands, Sweden, Denmark and Italy.

Exhibit 4 summarizes all conclusions: form a quasi-normal distribution in the period 2000-10 in the period 2011-60 the reduction in the variation of the real per capita GDP growth rate in the EU will for some countries skew the distribution of the difference between the growth rate of pharmaceutical expenditure and GDP (Financial Sustainability) to the left, making it more financially sustainable but, on the other hand, for some other countries, the reduction in the growth rate of the GDP will render pharmaceutical expenditure less financially sustainable in the long-term and skew their distribution to the right.

Exhibit 4: Normal Quantile-Quantile Plot (Z standardized variables) of the Financial Sustainability of Pharmaceutical Expenditure in the European Union (*N*=21) in the period 2000-2010 and 2011-2060



Source: Authors' elaborations on OECD Health Data 2011

Legenda:
AAGR – Average Annual Growth Rate
Notes:
Software R 3.0.1 – qqnorm()

We conclude that health policymakers in the European Union should account for this long-term expenditure growth patterns, and reform in the efficiency and effectiveness of health and pharmaceutical care is necessary if health outcomes are to be improved and at the same time the economic and financial sustainability of the European universal welfare model is to be preserved and inequality avoided.

References:

[1] Chernew M. et al. (2009) Increased Spending on Health Care: Long-Term Implications for the Nation, Health Affairs; 28: 1253-1255

[2] Docteur E. and Oxley H. (2003), Health-Care Systems: Lessons from the Reform Experience, , OECD Health Working Papers, No. 9, OECD, Paris

[3] Dormont B., Huber H. (2006) Causes of Health Expenditure Growth: The Predominance of Changes in Medical Practices Over Population Ageing, Annales d'Economie et de Statistique; 83/84, 187-217

[4] Duval, R. and C. de la Maisonneuve (2010), "Long-Run Growth Scenarios for the World Economy" Journal of Policy Modeling, Elsevier, Vol. 32, No. 1, pp.64-80

[5] European Commission (2012), "Six-pack? Two-pack? Financial compact? A short guide to the new EU Financial governance." Navigation path European Commission Economic and Financial Affairs News Economic governance",http://ec.europa.eu/economy_finance/articles/governance/2012-03-14_six_pack_en.htm (accessed 11/30/2012)

[6] Eurostat (2005), "The Pharmaceutical Industry in the European Union", Statistics in Focus – Industry, Trade and Services, No. 44/2005, Eurostat, LuxembourgGunilla Backman, Paul Hunt, Rajat Khosla, Camila Jaramillo-Strouss, Belachew Mekuria Fikre, Caroline Rumble, David Pevalin, David Acurio Páez, Mónica Armijos Pineda, Ariel Frisancho, Duniska Tarco, Mitra Motlagh, Dana Farcasanu, Cristian Vladescu (2008), "Health systems and the right to health: an assessment of 194 countries", Lancet; 10(12): 2047-85

[7] Haines A. et al. (2012) From the Earth Summit to Rio+20: integration of health and sustainable development, The Lancet; 379: 2189–97

[8] Huber M., A. Stanicole J.B. and Wahlbeck K. (2008). Quality in and Equality of Access to Healthcare Services. European Commission Directorate-General for Employment, Social Affairs and Equal Opportunities, Luxembourg

[9] International Monetary Fund (2012), Greece and the IMF, http://www.imf.org/external/country/grc/index.htm (accessed 11/14/12)

[10] International Monetary Fund (2012), "IMF Urges Eurozone to Make More Determined, Collective Response to Crisis", http://www.imf.org/external/pubs/ft/survey/so/2012/CAR062112A.htm (accessed 11/30/2012)

[11] ITA – International Trade Administration (2004), Pharmaceutical Price Controls in OECD Countries: Implications for US Consumers, Pricing, Research and Development, and Innovation, US Department of Commerce, Washington, D.C.

[12] Kelley, E. and J. Hurst (2006). Health Care Quality Indicators Project Conceptual Framework. OECD Health Working Paper, No. 23, OECD Publishing, Paris

[13] Kleinert S. at al. (2012), New Voices in Global Health and sustainable development, The Lancet; Published online October 21, 2012, www.thelancet.com (accessed 11/11/12)

[14] Li, H., J. Zhang and J. Zhang (2007), "Effects of Longevity and Dependency Rates on Saving and Growth: Evidence from a Panel of Cross Countries", Journal of Development Economics, Vol. 84, No. 1, pp.138-154

[15] Mackenbach, J.P. et al. (2008), Socioeconomic Inequalities in Health in 22 European Countries, New England Journal of Medicine; 358: 2468-2481

[16] Masseria, C. and M. Giannoni (2010), Equity in Access to Health Care in Italy: A Disease Approach, European Journal of Public Health; 20-5: 504-510

[17] OECD (1985), Measuring Health Care, 1960-1983: Expenditure, Costs and Performance, OECD Publishing, Paris.

[18] OECD (2003a), A Disease-based Comparison of Health Systems: What is Best and at What Cost?, OECD Publishing, Paris

[19] OECD (2003b), The Sources of Economic Growth in OECD Countries, OECD Publishing
[20] OECD (2004a), Towards High-performing Health Systems, OECD Publishing, Paris.
[21] OECD (2004b), Private Health Insurance in OECD Countries, OECD Publishing, Paris.
[22] OECD (2005a), Long-term Care for Older People, OECD Publishing, Paris.
[23] OECD (2007), Main Science and Technology Indicators. Vol. 2007/2, Paris
[24] OECD (2008), Pharmaceutical Pricing Policies in a Global Market, OECD Publishing, Paris.
[25] OECD (2009), Health at a Glance 2009: OECD Indicators, OECD Publishing, Paris.
[26] OECD (2010a), Health Care Systems: Efficiency and Policy Settings, OECD Publishing, Paris.
[27] OECD (2010b), Value for Money in Health Spending, OECD Health Policy Studies, OECD Publishing, Paris.
[28] OECD (2011a), OECD Health Data 2011, online, OECD Publishing, Paris, http://stats.oecd.org/index.aspx (Health).
[29] OECD (2011b), OECD Regions at a Glance 2011, OECD Publishing, Paris
[30] OECD, Eurostat and WHO (2011), A System of Health Accounts, 2011 Edition, OECD Publishing, Paris
[31] OECD (2011), A System of Health Accounts – 2011 Edition, OECD Publishing, Paris.
[32] OECD (2012a). Looking to 2060: long-term global growth prospects. A going for growth report, OECD Publishing, Paris
[33] OECD (2012b). Health at a glance 2011. http://www.oecd.org (accessed 11/9/2012)
[34] OECD (2012c), Medium and Long-term Scenarios for Global Growth and Imbalances, OECD Economic Outlook, No. 91, OECD Publishing
[35] OECD (2012d) Growth in health spending grinds to a halt, Published online, http://www.oecd.org/document/39/0,3746,en_21571361_44315115_50655591_1_1_1_1,00.html (accessed 7 2012)
[36] OECD (2012e) Health at a glance. Europe 2012. http://www.oecd.org (accessed 20/11/2012)
[37] Okunade, A.A. and C. Suraratdecha (2006), The Pervasiveness of Pharmaceutical Expenditure Inertia in the OECD Countries, Social Science and Medicine, Vol. 63, pp. 225-238
[38] Olgiati S. et al. (2012). Sustainability of universal health coverage in Italy: a modelling study, Lancet; Published online October 21, 2012, www.thelancet.com (accessed 11/11/12
[39] OECD (2006), "Projecting OECD health and long-term care expenditures: what are the main drivers?", Economic Department Papers, Paris; 477
[40] OECD (2008), "Pharmaceutical Pricing Policies in a Global Market", OECD Publishing, Paris. OECD, Eurostat and WHO (2011), A System of Health Accounts, 2011 Edition, OECD Publishing, Paris
[41] OECD (2011), "A System of Health Accounts – 2011 Edition", OECD Publishing, Paris.
[42] OECD (2012), "Looking to 2060: long-term global growth prospects. A going for growth report", OECD Publishing, Paris
[43] OECD (2012), "Health at a glance 2011", http://www.oecd.org (accessed 11/9/2012)
[44] OECD (2012), "Medium and Long-term Scenarios for Global Growth and Imbalances", OECD Economic Outlook, No. 91, OECD Publishing
[45] OECD (2012), "Growth in health spending grinds to a halt", Published online, http://www.oecd.org/document/39/0,3746,en_21571361_44315115_50655591_1_1_1_1,00.html (accessed 7 2012)

[46] OECD (2012), "Health at a glance. Europe 2012", http://www.oecd.org (accessed 20/11/2012)
[47] OECD (2012), "Financial Consolidation: How much, how fast and by what means?", http://www.oecd.org/document/1/0,3746,en_21571361_44315115_50109953_1_1_1_1,00.html (accessed 2012 21-6).
[48] OECD (2012), "Economy: Global economy recovering, but major risks remain, says OECD", http://www.oecd.org/document/16/0,3746,en_21571361_44315115_50405584_1_1_1_1,00.html (accessed 2012 21-6).
[49] Olgiati S., Danovi A., Lanzarini A., Cesana G. (2012), "The financial framework of the sustainability of health universal coverage in Italy. A quantitative financial model for the assessment of the italian stability and reform program of public health financing", Cornell University Library; arXiv:1207.6278: 11-12
[50] Olgiati S., Danovi A., Lanzarini A., Cesana G. (2012), "Sustainability of universal health coverage in Italy: a modelling study", Lancet; Published online October 21, 2012, www.thelancet.com (accessed 11/11/12)
[51] Roberts A., Charlesworth A. (2012), Future demand for health care: a modelling study, Lancet; Published online October 21, 2012, www.thelancet.com (accessed 11/11/12)
[52] Scherer, P. and M. Devaux (2010), The Challenge of Financing Health Care in the Current Crisis: An Analysis Based on the OECD Data, OECD Health Working Paper, No. 49, OECD Publishing, Paris
[53] Sirven, N. and Z. Or (2010), Disparities in Regular Health Care Utilisation in Europe, IRDES Working Paper, No. 37, IRDES, Paris
[54] Thomson, S., Foubister T., and Mossialos E. (2009), "Financing Health Care in the European Union", Edited by European Observatory on Health Systems and Policies Studies Series N. 17. World Health Organization
[55] WHO (2010), "The World Health Report: Health Systems Financing: The Path to Universal Coverage", WHO, Geneva